

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE

INFRARED SPECTRAL STUDIES OF ASTEROIDS

(NAGW 802)

PERFORMING ORGANIZATION

Planetary Geosciences Division / Hawaii Institute of Geophysics
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INVESTIGATOR'S NAME

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DESCRIPTION (a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)

- a) *Strategy:* The research objective is to improve our understanding of the surface mineralogy of asteroids and to link the vast existing body of meteorite geochemical data with specific astronomical objects which may be the targets of future NASA missions. The methodology employed is 1) use advanced astronomical instrumentation to obtain reflection spectra in the 0.3-5.2 μ m wavelength range of selected asteroids; 2) compare the asteroid data with similar data on simulated asteroid regoliths of various compositions to determine the surface mineralogy and meteoritic affinities of asteroid spectral classes and specific asteroids; 3) integrate the mineralogical information with other astronomical data, orbital dynamics studies, and meteorite geochemistry data to reconstruct the condensational, thermal, and collisional history of the present asteroids and their parent planetesimals; 4) use the information obtained to assist planning of future NASA asteroid missions such as Galileo and CRAF.
- b) *Progress (1987-88):* Prepared for final publication of 52-Color Asteroid Survey; continued comprehensive IR spectral survey of S-type asteroids; observed selected members of the Eos family and discovered close spectral similarity to CO/CV chondrites; provided information for selection of candidate asteroid flyby targets for Galileo and CRAF missions; defined new 3-color photometric system in 2.8-3.4 μ m spectral region for future studies of the bound-water band in this region.
- c) *Proposed Research:* Publish 52-color survey spectra; continue to acquire spectra of selected S-type asteroids, Earth-crossers, and members of asteroid dynamical families; continue to assist planning for Galileo and CRAF mission asteroid flybys; possibly begin observing program in mid-IR.
- d) *Summary Bibliography (1987-88):* 2 papers published, 1 in press, 3 submitted.

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OF POOR QUALITY

Bell, J. F., and B. R. Hawke, "Recent Comet Impacts on The Moon: The Evidence from Remote Sensing Studies." *Pub. Ast. Soc. Pacific* **99**, 862-867 (1987).

Bell, J. F., and K. Keil, "Spectral Alteration Effects in Chondritic Regolith Breccias", *Proc. Lunar Planet. Sci. Conf. 18th*, (G. Ryder, ed.), Cambridge Univ. Press, 573-580 (March 1988).

Bell, J. F., R. H. Brown, and B. R. Hawke, "Composition and Size of Earth-Crossing Asteroid 1984KB." *Icarus* **73**, 482-486 (1988).

Piscitelli, J. R., D. P. Cruikshank, and J. F. Bell, "Laboratory Studies of Irradiated Nitrogen-Methane Mixtures: Applications to Triton." *Icarus*, in press.

Bell, J. F. "Mineralogical Clues to the Origins of Asteroid Dynamical Families." *Icarus*, submitted 16/V/88.

Bell, J. F., M. J. Gaffey, and D. Davis, "Nature and Evolution of the Asteroids." To appear in *ASTEROIDS II*, Univ. of Arizona Space Science Series (submitted 25/V/88).

Gaffey, M. J., J. F. Bell, and D. P. Cruikshank, "Reflection Spectroscopy and Surface Mineralogy of Asteroids." To appear in *ASTEROIDS II*, Univ. of Arizona Space Science Series (submitted VI/88).